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TI Zeolite insecticides.

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	US 5576007	A	19961119	US 1993-78169	19931021
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ASSIGNMENT HISTORY FOR US PATENT AVAILABLE IN LSUS DISPLAY FORMAT

AB An insecticide, especially for termites, contains powdered synthetic or natural zeolites, having particle size lower than the distance between the body hairs of the insect to be exterminated. Powdered silica gel, anhydrous silicic acid, or other substance may be incorporated into the zeolite preparation. The prepn.s. are safe and nonpolluting and generate no resistance. OSC.G 3 THERE ARE 3 CAPLUS RECORDS THAT CITE THIS RECORD (3 CITINGS)

RE.CNT 2 THERE ARE 2 CITED REFERENCES AVAILABLE FOR THIS RECORD
ALL CITATIONS AVAILABLE IN THE RE FORMAT

AN 1993-152065 [199318] WPIDS Full-text
DNC C1993-067847 [199318]
TI Material to exterminate insect pests e.g. termites, ticks or mites -
containing zeolite with particles small enough to get between insect body
hairs, useful for long-term non-toxic control
DC C03
IN IKEDA A; IKEDA S; INOUE Y; YAMAMOTO N
PA (SHIK-N) SHIKOKU SOGO KENKYUJO KK; (SHIK-N) SHIKOKU SOGO KENKYUSHO KK
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EP 579834 A1 19940126 (199404) EN 12
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Material for eliminating insect pests contains powdered zeolite where the size of
the zeolite particles is smaller than the space (P) between the hairs on the insect's
body.
The material contains clay materials, siliceous materials, shirasu volcanic ash,
potassium carbonate, fly ash, especially as powder smaller than (P). The material
may also contain silica gel and/or silica. The zeolite is natural or synthetic.
The material may also contain cpds. with e.g. insecticidal activity.
USE/ADVANTAGE - For eliminating termites, ticks, flies, mosquito lice, mites, etc.
without damaging the environment or humans and animals by using (synthetic) chemical
insecticides such as the pyrethroids. The insects do not become resistant to the
material, which can therefore be used long-term. The material works by coming in
contact with the insect's skin and interfering with respiration by absorbing gases
or entering the spiracles, or it injures the skithee
FS CPI
MC CPI: C05-B02C; C12-B04; C12-N02

INSECT PEST EXPELLING MATERIAL

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Applicant(s): SHIKOKU SOGO KENKYUSHO KK +

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more >>

Abstract of JP 5201818 (A)

PURPOSE: To obtain an insect pest expelling material having slight fear of bad influence on human and animals except insect pests and environmental pollution, not providing insect pests with resistance brought about by use, capable of surely exterminating insect pests for a long period of time. **CONSTITUTION:** An insect pest expelling material containing powdery zeolite in which zeolite particles having particle diameters smaller than gap size of body hair of target insect pest are contained. The insect pest expelling material may be mixed with a solid material selected from a solid material group of clay minerals, diatomaceous earth, shirasu, calcium carbonate and fly ash in a powdery state and further silica gel and silicic anhydride. The insect pest expelling material containing particles having particle diameters smaller than gap size of body hair reaches the surface of body of insect pest through the gap of body hair, prevents discharge of carbon dioxide gas and/or intake of oxygen through skin, closes stomata in the case of insect pest having a stoma, suppresses intake of oxygen and kills insect pests.

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(30)Priority

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(54) INSECT PEST EXPELLING MATERIAL

(57)Abstract:

PURPOSE: To obtain an insect pest expelling material having slight fear of bad influence on human and animals except insect pests and environmental pollution, not providing insect pests with resistance brought about by use, capable of surely exterminating insect pests for a long period of time.

CONSTITUTION: An insect pest expelling material containing powdery zeolite in which zeolite particles having particle diameters smaller than gap size of body hair of target insect pest are contained. The insect pest expelling material may be mixed with a solid material selected from a solid material group of clay minerals, diatomaceous earth, shirasu, calcium carbonate and fly ash in a powdery state and further silica gel and silicic anhydride. The insect pest expelling material containing particles having particle diameters smaller than gap size of body hair reaches the surface of body of insect pest through the gap of body hair, prevents discharge of carbon dioxide gas and/or intake of oxygen through skin, closes stomata in the case of insect pest having a stoma, suppresses intake of oxygen and kills insect pests.

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(57) Abstract

Objects of the InventionThere are little adverse effect to men and beasts other than a noxious insect and fear of environmental pollution, and a noxious insect does not possess the resistance accompanying use, but the extermination-of-harmful-insects material which can exterminate a noxious insect certainly is provided over a long period of time.

Elements of the InventionIt is the extermination-of-harmful-insects material containing powdered zeolite, and what has particle diameter smaller than the interval size P of the hair 3 of the noxious insect 1 used as a candidate for extermination is contained in the extermination-of-harmful-insects material 41, 42, and 43 which consists of the powdered zeolite.

Claim(s)

Claim 1Extermination-of-harmful-insects material which is extermination-of-harmful-insects material containing powdered zeolite, and is characterized by containing what has particle diameter smaller than an interval size of hair of a noxious insect used as a candidate for extermination in the powdered zeolite.

Claim 2Extermination-of-harmful-insects material, wherein a solid of 1 or 2 or more kinds chosen as said extermination-of-harmful-insects material from a solid group which consists of argillite, diatomaceous earth, mill, calcium carbonate, and fly ash in the extermination-of-harmful-insects material according to claim 1 is powdered and is added.

Claim 3Extermination-of-harmful-insects material, wherein said solid powdered and added in

the extermination-of-harmful-insects material according to claim 2 contains a thing in which the particle diameter is smaller than an interval size of hair of a noxious insect used as a candidate for extermination.

Claim 4Extermination-of-harmful-insects material having added powdered silica gel to said extermination-of-harmful-insects material in the extermination-of-harmful-insects material according to any one of claims 1 to 3.

Claim 5Extermination-of-harmful-insects material having added a powdered silica to said extermination-of-harmful-insects material in the extermination-of-harmful-insects material according to any one of claims 1 to 4.

Claim 6Extermination-of-harmful-insects material forming said zeolite by natural zeolite in the extermination-of-harmful-insects material according to any one of claims 1 to 5.

Claim 7Extermination-of-harmful-insects material forming said zeolite by artificial zeolite in the extermination-of-harmful-insects material according to any one of claims 1 to 5.

Claim 8Extermination-of-harmful-insects material having added weak drugs of drug effect to said extermination-of-harmful-insects material in the extermination-of-harmful-insects material according to any one of claims 1 to 7.

Detailed Description of the Invention

0001

Industrial ApplicationThis invention relates to extermination-of-harmful-insects material.

0002

Description of the Prior ArtIt is common to use a chemical insecticide, when exterminating noxious insects including a termite, TSUMEDANI, etc., for example, when aiming at extermination of a termite or ticks, the powerful chemical insecticide of acute toxicity is widely used like organic phosphorus system drugs or pyrethroid system drugs.

0003

Problem to be solved by the inventionBy the way, although this kind of chemical insecticide exterminates a noxious insect by the drug effect of that chemical constituent, many that chemical constituent has an adverse effect to men and beasts, and we are anxious also about the environmental pollution which makes spraying of the strong chemical of acute toxicity a cause.

0004With use of a chemical insecticide, a noxious insect is gradually provided with insecticide resistance (resistance), and it arises that the effective chemical insecticide stops doing the effect as an insecticide so eventually at the beginning.

0005It was made based on such a background, and there are little adverse effect to men and beasts other than a noxious insect and fear of environmental pollution, and a noxious insect does not possess the resistance accompanying use, but an object of this invention is to provide the extermination-of-harmful-insects material which can exterminate a noxious insect certainly over a long period of time.

0006

Means for solving problemIn order to attain this purpose, the invention according to claim 1 is the extermination-of-harmful-insects material containing powdered zeolite, and contains what has particle diameter smaller than the interval size of the hair of the noxious insect used as the candidate for extermination in that powdered zeolite.

0007

FunctionSince zeolite has a humidity buffer effect according to the extermination-of-harmful-insects material according to claim 1, the humidity of the space in which this extermination-of-harmful-insects material was installed can be maintained at a dry state unsuitable to habitation of a noxious insect.

0008Therefore, in the space where this extermination-of-harmful-insects material was constructed, even if a noxious insect's noxious insect which cannot live easily and lives in this space decreases and a noxious insect lives, that noxious insect will live, after the vital force has weakened.

0009And since said zeolite contains the thing in which the particle diameter is smaller than the interval size of the hair of a noxious insect, The fine-grained fraction can adhere to the body surface of a noxious insect, without being barred by the hair of the noxious insect which lives here, and since discharge of the carbon dioxide from the skin of a noxious insect is controlled by this, it can make a noxious insect die of respiratory failure.

0010Since the particles of the fine-grained fraction of said zeolite can be made to adhere to a spiracle and introduction of oxygen of a noxious insect is barred by this when the noxious insect for extermination is what has a spiracle, a noxious insect can be made to die by an oxygen deficiency.

0011Moreover, generally, insects, such as a noxious insect, perform operation which shakes off that foreign matter when a foreign matter adheres to that body surface and hair, and a noxious insect produces abrasion in a body surface itself by this operation.

Said fine-grained fraction can suck the body fluid of a noxious insect out of this abrasion by the hygroscopicity which zeolite has, and can make a noxious insect die by considering it as dehydration by adhering to abrasion, without being barred by hair.

0012Such zeolite is what does not have as strong toxicity as the conventional extermination-of-harmful-insects agent, and also it does so the good extermination-of-harmful-insects effect according to the above mechanisms.

0013Therefore, there can be little adverse effect to men and beasts other than a noxious insect and fear of environmental pollution, and a noxious insect cannot possess the resistance accompanying use, but the extermination-of-harmful-insects material which can exterminate a noxious insect certainly can be provided over a long period of time.

0014

Working exampleAlthough an embodiment explains this invention hereafter, referring to Drawings, the extermination-of-harmful-insects effect by zeolite is explained to the beginning.

0015Since it is thought that the physical extermination-of-harmful-insects effect by zeolite is produced by the following three mechanisms' compounding and functioning according to an invention-in-this-application person's research, they are explained below.

0016First, drawing 1 explains the 1st mechanism.

0017Drawing 1 is a mimetic diagram of the body surface of a noxious insect, and, as for 1, the skin of the body surface of a noxious insect and 3 are hair of a noxious insect a noxious insect and 2.

41, 42, 43, and 44 are extermination-of-harmful-insects material which consists of powdered zeolite.

0018This noxious insect 1 has taken in oxygen inside of the body through a spiracle or the skin 2.

Discharge of the carbon dioxide to the outside of the body is performed through the direct skin 2.

0019And two or more hair 3 is formed in the skin 2 which discharges carbon dioxide in this way at the shape of a dissemination.

0020Such hair 3 is formed in the position according to the kind of noxious insect 1, respectively.

If a ** type-izing **various kinds of noxious insects are taken into consideration** and standardly, although it is what differs also in the interval size of these hair 3, for the simplification of the following explanation, the interval size P of each hair 3 will come out uniformly, and let it be a certain thing so that the arrangement of the hair 3 on the skin 2 of the noxious insect 1 may be drawing 1.

0021Although the extermination-of-harmful-insects material 41, 42, 43, and 44 is a thing of various form actual naturally, in order to simplify explanation of the following mechanisms, in Drawings, it shall display as circular, and each shall differ only in the particle diameter.

0022Thus, the extermination-of-harmful-insects material 41, 42, and 43 to the skin 2 top in which the hair 3 is formed, and the situation of adhesion of 44 are as follows.

0023That is, although the particle diameter D_1 of the extermination-of-harmful-insects material 41 is a little smaller than the interval size P of the hair 3, it is almost equivalent.

0024Therefore, the extermination-of-harmful-insects material 41 can reach the skin 2 of the noxious insect 1 through a gap of the hair 3.

0025And the extermination-of-harmful-insects material 41 which reached on the skin 2 of the noxious insect 1 will adhere on the skin 2 with lipid, moisture, etc. on the skin 2.

0026As for the skin 2 of a portion located under the extermination-of-harmful-insects material 41, exocytosis of carbon dioxide from the surface is barred by this. In the case of a noxious insect which takes in oxygen from the skin 2, introduction of oxygen from the skin 2 of the part

concerned is also simultaneously barred by this extermination-of-harmful-insects material 41.

0027The particle diameter D_2 of the extermination-of-harmful-insects material 42 is smaller than said extermination-of-harmful-insects material 41, and the particle diameter of the extermination-of-harmful-insects material 43 is still smaller than particle diameter D_2 of said extermination-of-harmful-insects material 42.

0028The extermination-of-harmful-insects material 42 and 43 in which the particle diameter is smaller than said extermination-of-harmful-insects material 41 can reach the skin 2 of the noxious insect 1, without being barred by said hair 3 so that clearly also from drawing 1, like said extermination-of-harmful-insects material 41, adheres on the skin 2 and bars exocytosis of carbon dioxide of the noxious insect 1, etc.

0029The extermination-of-harmful-insects material 44 is a comparative example in the example of this explanation, and that particle diameter D_4 is larger than the interval size P of said hair 3. Since one of the hair 3 will bar the adhesion so that clearly from drawing 1, the extermination-of-harmful-insects material 44 of this particle diameter cannot bar exocytosis of the carbon dioxide from the skin 2 of the noxious insect 1, etc. like said extermination-of-harmful-insects material 41, 42, and 43.

0030When discharge of the carbon dioxide from the skin 2 of the portion is barred by adhesion of said extermination-of-harmful-insects material 41, 42, and 43, When a function falls according to the area of the adhering portion in general and the area of the portion crosses tolerance level, it becomes respiratory failure and, as for the respiration of the noxious insect 1, the noxious insect 1 will die finally.

0031Therefore, in exterminating a noxious insect using such extermination-of-harmful-insects material. Expansion of the area to which the extermination-of-harmful-insects material 41, 42, and 43 to the skin 2 adhered is very important, and the purpose of extermination of harmful insects is attained through expansion of said adhesion area by selecting suitably the particle diameter of extermination-of-harmful-insects material according to a noxious insect.

0032Next, although drawing 2 explains the 2nd mechanism, this 2nd mechanism is restricted when the noxious insect for extermination is what has a spiracle.

0033Drawing 2 is what showed the section in the spiracle of a noxious insect typically, and, as for the noxious insect to which 1 has a spiracle, and 2, the skin of the body surface of a noxious insect and 3 are hair of a noxious insect.

0034In the noxious insect 1 which has a spiracle, the trachea 5 prolonged from the inside of the body of the noxious insect 1 carries out an opening to the skin 2, forms the spiracle 6, and it these tracheae 5 and spiracles 6, Constituting the tracheal system 7 of the noxious insect 1, the tracheal system 7 has the function as a passage to lead the oxygen which the noxious insect 1 takes in inside of the body to the inside of the body.

0035In the noxious insect 1 which has such a spiracle 6, the interval size of the hair 3 is set to P near the spiracle 6, and the opening size (diameter) of the spiracle 6 is set to W.

0036And although 81, 82, 83, and 84 are extermination-of-harmful-insects material which consists of powdered zeolite in drawing 2, respectively and these extermination-of-harmful-insects material 81, 82, 83, and 84 is a thing of various form actual naturally, Displaying as a globular form in Drawings, in order to simplify explanation of the following mechanisms, each shall differ only in the particle diameter.

0037In about six spiracle of the noxious insect 1, the actions differ more how, the extermination-of-harmful-insects material 81, 82, and 83 functions as an active principle in the following explanation, and the extermination-of-harmful-insects material 81, 82, 83, and 84 is a thing of the particle diameter by which the extermination-of-harmful-insects material 84 is positioned as a comparative example.

0038That is, it is smaller than the interval size P of the hair 3, and the particle diameter D_5 of the extermination-of-harmful-insects material 81 is larger than the opening size W of the spiracle 6.

0039Therefore, the extermination-of-harmful-insects material 81 can reach the skin 2 of the noxious insect 1 through the gap of the hair 3, and can be located in the surface side of the spiracle 6. And the extermination-of-harmful-insects material 81 which reached on the skin 2 of the noxious insect 1 will adhere on the skin 2 with lipid, moisture, etc. on the skin 2, the spiracle 6 is covered and blocked by said extermination-of-harmful-insects material 81, and incorporation of oxygen from the spiracle 6 is checked.

0040The particle diameter D_6 of the extermination-of-harmful-insects material 82 is a little smaller than the interval size P of the hair 3, and the opening size W of the spiracle 6.

0041Therefore, although the extermination-of-harmful-insects material 82 reaches the skin 2 of the noxious insect 1 like said extermination-of-harmful-insects material 81, it can invade in the trachea 5 from the spiracle 6 further.

0042Since the extermination-of-harmful-insects material 82 which introduction of oxygen of the noxious insect 1 was spoiled, and invaded since the ventilation area of the trachea 5 became small substantially when the extermination-of-harmful-insects material 82 invaded into the trachea 5 does not drop out of the trachea 5 easily, the noxious insect 1 dies certainly eventually by a prolonged oxygen deficiency.

0043In the extermination-of-harmful-insects material 83 whose particle diameter is still smaller than said extermination-of-harmful-insects material 82, Said hair 3 does not almost have becoming trouble, when the extermination-of-harmful-insects material 83 reaches to the skin 2 of the noxious insect 1, and moreover, since it is a size whose spiracle 6 is also quite larger than the extermination-of-harmful-insects material 83, the extermination-of-harmful-insects material 83 can invade in the trachea 5 with comparatively high probability.

0044Thus, although it is difficult to blockade the trachea 5 like said extermination-of-harmful-insects material 82 only by single particles, the extermination-of-harmful-insects material 83 which invaded in the trachea 5, Since it invades in the trachea 5 with above comparatively high probability, by two or more extermination-of-harmful-insects material's 83 adhering, and accumulating it, the aeration cross-section area of the trachea 5 will become small, and the noxious insect 1 will be in anoxic conditions.

0045In the case of said noxious insect 1, the extermination-of-harmful-insects material 84 becomes with a comparative example, and the particle diameter D_7 is larger than the interval size P of said hair 3.

0046In such a case, since the extermination-of-harmful-insects material 84 cannot reach the skin 2 of the noxious insect 1 by the hair 3, the blockade function to the spiracle 6 is not expectable. However, since the interval size P of said hair 3 and the opening size W of the spiracle 6 take the value which changes with kinds of noxious insect, it can act as a thing equivalent to the extermination-of-harmful-insects material 81-83 which this extermination-of-harmful-insects material 84 described above depending on the kind of noxious insect.

0047Thus, since the extermination-of-harmful-insects material 81, 82, and 83 adheres to the tracheal system 7 of the noxious insect 1 and introduction of oxygen from the spiracle 6 of the noxious insect 1 is barred, the noxious insect 1 dies by an oxygen deficiency, and attains the purpose of extermination of harmful insects.

0048Next, although drawing 3 explains the 3rd mechanism, this 3rd mechanism is a physical extermination-of-harmful-insects mechanism using the humidity buffer effect which zeolite has.

0049Although natural zeolite and artificial zeolite exist in zeolite, any zeolite has bigger, ion exchange capacity general in general than 50 meq(s)/100 g.

It has the humidity buffer effect or hygroscopicity required in order that the 3rd mechanism described below may function.

0050The noxious insect 1 shall perform the action which tries to shake off that foreign matter itself when a foreign matter generally adheres to that skin 2 and hair 3, the abrasion 11 shall arise on the skin 2 of the noxious insect 1 in connection with this action, and the body fluid of the noxious insect 1 shall begin to bleed on the skin 2.

0051Therefore, when the extermination-of-harmful-insects material 12 which becomes a part of the abrasion 11 formed by doing in this way from said zeolite is contacted, the body fluid of the noxious insect 1 will be ***** (ed) by the humidity buffer effect or hygroscopicity of the zeolite 12, and the noxious insect 1 will die by drying.

0052In order for such a mechanism to function, it is required for zeolite to arrive even at the part of said abrasion 11 on the skin 2, but. As mentioned above, since the hair 3 generally exists in the skin 2 of the noxious insect 1 and this bars contact of said extermination-of-harmful-insects material 12 on it, it is important for it to avoid the obstacle by this hair 3 and to make the extermination-of-harmful-insects material 12 arrive at the part of the abrasion 11 on the skin 2.

0053Therefore, when zeolite is made powdered and particle diameter D_8 of the extermination-of-harmful-insects material 12 which consists of the powdered zeolite considers it as a thing smaller than the interval size P of the hair 3 of the noxious insect 1, The probability to the portion of the abrasion 11 of the extermination-of-harmful-insects material 12 of contacting can be raised, and a noxious insect can be made to die certainly by this.

0054The extermination-of-harmful-insects material 13 illustrates the situation where it is barred that that particle diameter D_9 shows a larger thing than the interval size P of said hair 3, and this extermination-of-harmful-insects material 13 contacts the part of the abrasion 11 when the hair 3 exists. In drawing 3, in order to make an understanding of the 3rd mechanism easy, the extermination-of-harmful-insects material 12 and 13 was displayed simple as spherical, but it cannot be overemphasized actually that they are various odd shape.

0055The advantage common to the 1st thru/or the 3rd mechanism by the powdered zeolite explained above is being able to exterminate a noxious insect, without transpiring the strong chemical of acute toxicity at high concentration in the space which should exterminate a noxious insect unlike insect killing by the conventional chemical insecticide. Since it is performed by the physical property of a powdered solid, without providing a noxious insect with resistance gradually while originating in this and being able to avoid the influence and the environmental pollution of a chemical insecticide to men and beasts, it is that a noxious insect is exterminable over a long period of time.

0056The extermination-of-harmful-insects effect of zeolite considered to produce by the above 1st thru/or the 3rd mechanism's compounding, and functioning was checked by the following check tests.

0057That is, this check test covers a petri dish with filter paper, on this filter paper, it covers with powdered extermination-of-harmful-insects material uniformly, and it accustoms it, puts ten noxious insects in the petri dish of this state, and observes the active state of a noxious insect temporally.

0058The petri dish used by this check test is a thing 9 cm in diameter. It shall suppose that said 0.64g (it is equivalent to the state where extermination-of-harmful-insects material was sprinkled at a rate of $100\text{g} / \text{m}^2$) of extermination-of-harmful-insects material is put in, and is performed, and the worker ant of *Coptotermes formosanus* shall be used as a noxious insect.

0059In this case, the opening size W of 63 micrometers and a spiracle of the interval size P of said hair of the noxious insect 1 is 30 micrometers in general.

0060Hereafter, the check test of the extermination-of-harmful-insects effect of the 1st embodiment and the 2nd embodiment which are the extermination-of-harmful-insects material which used natural zeolite by a single taste is explained.

0061The extermination-of-harmful-insects material of these 1st and 2nd embodiments makes the fine-grained fraction which crushed the zeolite rock which is the aluminosilicate mineral produced naturally extermination-of-harmful-insects material.

0062The natural zeolite used for the 1st embodiment is an IZUKA light by Izumo chemistry incorporated company (trade name), and it is ZEOFIRU by new northeast chemical industry incorporated company (trade name) which is used for the 2nd embodiment.

0063The chemical entity (weight %) of the natural zeolite used for these 1st and 2nd embodiments is shown in front .1. The chemical entity of the artificial zeolite which is the 3rd below-mentioned embodiment is also collectively shown in front .1.

0064

Front .1

For drawings please refer to the original document.

After crushing each zeolite rock which has such a chemical entity by a publicly known crusher, particle sorting was performed and it was considered as the extermination-of-harmful-insects material of the 1st and 2nd embodiments.

0065And when the ion exchange capacity of the extermination-of-harmful-insects material of these 1st and 2nd embodiments was measured based on the zeolite test method of an inherent-powers improvement enforcement ordinance, respectively, the 1st embodiment was 130 to 160 meq/100g, and the 2nd embodiment was 150 to 170 meq/100g.

0066Thus, as the particle size distribution of the extermination-of-harmful-insects material of the 1st embodiment that consists of formed powdered natural zeolite is drawing 4, the particle size distribution of the 2nd embodiment is as being shown in drawing 5.

0067In the case of the extermination-of-harmful-insects material which consists of natural zeolite of said 1st embodiment, from such size distribution figures, Particle diameter is smaller

than 63 micrometers which is an interval size of the hair of a noxious insect, and it is a little more than 85% which functions as an active principle in the 1st thru/or the 3rd mechanism, among those 65% is an active principle applicable to the extermination-of-harmful-insects material 82 and 83 in said 2nd mechanism in general. And although there is little remainder which is except these active principles as a little less than 15%, these remainders do so the function to reduce the humidity in the space where extermination-of-harmful-insects material was sprinkled chiefly.

0068In the case of the extermination-of-harmful-insects material which consists of natural zeolite of said 2nd embodiment, It is 40% which functions as an active principle in the 1st thru/or the 3rd mechanism in general by the weight, and among those, in said 2nd mechanism, it is an active principle applicable to the extermination-of-harmful-insects material 82 and 83, and the remainders which are except these active principles have increased in number with 60% in general a little more than 25%.

0069The result of the check test using the extermination-of-harmful-insects material which consists of such powdered natural zeolite is as follows, and is explained in order below.

0070First, the case of the natural zeolite of the 1st embodiment is explained.

0071In after from the injection of the termite to the petri dish which has arranged the extermination-of-harmful-insects material which consists of natural zeolite of the 1st above mentioned embodiment 1-hour progress, Ten supplied termites made all ten extermination-of-harmful-insects material adhere all over the body, and survived, the inner 8 animal moved about, and remaining two animals carried out the butter butter of an antenna and the leg in each part.

0072Four animals had died after 2-hour progress from the injection of the termite, and it was only that no less than the six remaining animals move an antenna and a leg occasionally in each part.

0073Nine animals had died after 3-hour progress from the injection of the termite, and the one remaining animals carried out the butter butter of an antenna or the leg.

0074Nine animals had died after 4-hour progress from the injection of the termite, and the one remaining animals carried out the PIKUPIKU spasm of the leg.

0075Ten animals had died after 5-hour progress from the injection of the termite, and the check test was ended.

0076Next, the case of the natural zeolite of the 2nd embodiment is explained.

0077Although ten termites supplied after 1-hour progress from the injection of the termite to the petri dish which has arranged the extermination-of-harmful-insects material which consists of natural zeolite of the 2nd above mentioned embodiment survive, the inner 5 animal moved about and remaining five animals carried out the butter butter of an antenna and the leg in each part.

0078Nine animals had died after 2-hour progress from the injection of the termite, and the one remaining animals were cramping the leg with PIKUPIKU.

0079The one remaining animals had also died after 3-hour progress from the injection of the termite, and all the supplied termites died.

0080If the termite which died from the check test of these 1st and 2nd embodiments is observed under a microscope, On the skin of the body surface of each termite, said extermination-of-harmful-insects material which consists of powdered natural zeolite has adhered including the portion of a spiracle, and said 1st thru/or the 3rd mechanism compound, all function, and it can be guessed that they are those from which the termite died.

0081Next, the check test of the extermination-of-harmful-insects effect in the case of the 3rd embodiment used by a single taste by making artificial zeolite into extermination-of-harmful-insects material is explained.

0082In this case, the artificial zeolite used as extermination-of-harmful-insects material of the 3rd embodiment is coal ash zeolite by Nippon Steel Corp., and formed the extermination-of-harmful-insects material which consists of powdered artificial zeolite.

0083Thus, the ion exchange capacity of the extermination-of-harmful-insects material of the 3rd embodiment that consists of formed powdered artificial zeolite is 200 to 350 meq/100g, and the chemical entity is as having indicated to said table .1.

0084The particle size distribution of the extermination-of-harmful-insects material of the 3rd embodiment that consists of this powdered artificial zeolite is as drawing 6.

It is a little more than 95% which functions as an active principle in the 1st thru/or the 3rd mechanism, and a little more than 85% is an active principle applicable to the extermination-of-harmful-insects material 82 and 83 in said 2nd mechanism among those.

0085The result of the check test of the extermination-of-harmful-insects effect done like the above using the extermination-of-harmful-insects material which consists of this powdered artificial zeolite is as follows.

0086In after from the injection of the termite to the petri dish which has arranged the extermination-of-harmful-insects material which consists of the above mentioned powdered artificial zeolite 1-hour progress, Ten supplied termites made all ten extermination-of-harmful-insects material adhere all over the body, and survived, the inner 8 animal moved about, and remaining two animals carried out the butter butter of an antenna and the leg in each part.

0087One animal had died after 2-hour progress from the injection of the termite, and although the six remaining animals moved about, three animals only moved the antenna and the leg with PIKUPIKU.

0088Two animals had died after 3-hour progress from the injection of the termite, the seven remaining animals carried out the butter butter of an antenna and the leg, and one animal which remains was moving slowly.

0089Seven animals had died after 4-hour progress from the injection of the termite, and the three remaining animals carried out the butter butter of an antenna and the leg.

0090Nine animals had died after 5-hour progress from the injection of the termite, and the one remaining animals carried out the butter butter of the leg. Since it was in ** that the extermination-of-harmful-insects material which consists of the above mentioned powdered artificial zeolite has the extermination-of-harmful-insects effect, the check test was ended at this time.

0091Also in the termite which died from this check test, it was the same as that of the case of the extermination-of-harmful-insects material which said powdered extermination-of-harmful-insects material has adhered including the portion of a spiracle on the skin of the body surface of each termite, and consists of said natural zeolite.

0092Therefore, it is thought that said 1st the thru/or the 3rd mechanism compound similarly, and the extermination-of-harmful-insects effect of zeolite functions not only in natural zeolite but in artificial zeolite, Even if it is the artificial zeolite which used not only the aforementioned coal ash zeolite but milt as the raw material, the artificial zeolite which used blast furnace slag as the raw material, or permutite manufactured chemically, it is thought that it has the extermination-of-harmful-insects effect.

0093Thus, said 1st the thru/or the 3rd mechanism proved by powdered nature and artificial zeolite to the termite as a noxious insect, Since it is physically materialized in the relation between the interval size P of the hair 3 of the noxious insect 1 made the particle diameter of the powdered zeolite which is extermination-of-harmful-insects material, and applicable to extermination, or the opening size W of the spiracle 6 as described above, it is possible to use it to various kinds of noxious insects.

0094If the noxious insect which can be made applicable using the extermination-of-harmful-insects material of the invention in this application to extermination is mentioned, For example, not to mention TSUMEDANI of other termites and house ticks, a dust mite, an acarid mite, or cockroaches, Mosquitoes, flies, Siphonaptera, Anoplura, a powder-post beetle, SHIBAMMUSHI, NOSHIMEMADARAMEIGA, Oryzaephilus, Tribolium castaneum, a rice weevil, Callosobruchus, a HIMEMARU carpet beetle, HIMEKATSUOBUSHIMUSHI, a clothes moth, Chironomus, Psychodidae, Pentatomorpha, Abu, Ixodidae, the Stomoxys calcitrans, Chilo, a planthopper, Nephotettix, a soybean beetle, SHIROICHIMOJIMADARAMEIGA, sink IMUSHI, Pulvinaria, spider mites, aphids, a cabbage moth, an armyworm, a YASAI elephant beetle, Monochamus alternatus, and woodengravers. They are scarab beetles, SUJIKIRIYOTOU, SHIBATSUTOGA, etc.

0095The dust mite and acarid mite of the house ticks among the aforementioned noxious insects, Since it does not have a spiracle but oxygen from the skin 2 is taken in, When the extermination-of-harmful-insects material of the invention in this application is used, said 2nd mechanism does not function, but the natural zeolite which adhered to the skin according to the 1st mechanism, While performing the extermination by checking not only discharge of carbon dioxide but introduction of oxygen, it is certainly exterminable by drying from abrasion according to said 3rd mechanism.

0096And so that clearly from the above mentioned 1st thru/or the 3rd mechanism, when aimed at the different aforementioned noxious insect from a termite, Since the particle diameter of the thing used as the active principle of extermination-of-harmful-insects material

becomes settled according to the interval size P etc. of the hair of the noxious insect made into the object, It is preferred to adjust suitably the particle size distribution of the extermination-of-harmful-insects material to be used, and it is efficient to classify only the thing of particle diameter smaller than the interval P of the hair of the noxious insect in the case of the extermination-of-harmful-insects material which sets the noxious insect of a specific kind as an extermination target, and to use this for it as extermination-of-harmful-insects material.

0097For example, when making TSUMEDANI of house ticks into the noxious insect for extermination, the interval size of the hair is 30 micrometers in general.

0098If the extermination-of-harmful-insects material (thing of the particle size distribution of drawing 4) of said 1st embodiment is used for this TSUMEDANI, a little more than 65% of thing will function in general by weight % as an active principle which may reach the skin of TSUMEDANI.

0099Since the opening size W of the spiracle of TSUMEDANI is 1 micrometer in general, in said 2nd mechanism, the active principle which may function as the extermination-of-harmful-insects material 82 and 83 is a little less than 5% in weight %.

0100Therefore, if the particle size distribution of the extermination-of-harmful-insects material to be used is adjusted to what has many fine-grained fractions in this case and the interval size P of the hair 3 of that noxious insect, i.e., what, have larger particle diameter than 30 micrometers is excepted, Since the probability that extermination-of-harmful-insects material will adhere on the skin of TSUMEDANI increases, the extermination-of-harmful-insects effect becomes much more remarkable.

0101When performing extermination of harmful insects using the zeolite in which the extermination-of-harmful-insects effect was checked as mentioned above, nature or artificial zeolite may be used by a single taste like said each embodiment, but it is realistic to consider it as a mixture with the solid used as the reinforcement which strengthens a proper extender and the extermination-of-harmful-insects effect.

0102In this viewpoint, the invention-in-this-application person checked that each embodiment which consists of a mixture of the following solid material and zeolite had the extermination-of-harmful-insects effect as a result of the experiment using various kinds of solid material.

0103Although the result of the check test of those each embodiment and its extermination-of-harmful-insects effect is shown below, the zeolite used for these check tests is the same as that of said 1st embodiment, and the method of a check test of it is the same as that of the above.

0104First, the extermination-of-harmful-insects material of the 4th embodiment is explained.

0105The extermination-of-harmful-insects material of the 4th embodiment is the mixture which added talc which is argillite to said natural zeolite.

By weight, the blending ratio carries out said zeolite, and makes talc 10% 90%.

0106Talc is a kind of the magnesium argillite in which it is also called talc and the chemical formula is made into $Mg_3Si_4O_{10}(OH)_2$.

0107It seems that this talc is MARUO CALCIUM COMPANY LIMITED "3S Talc" (trade name), and that particle size distribution is shown in drawing 7. In this talc, that whole quantity is the particle diameter which can serve as an active principle to the termite as a noxious insect so that it may become clear from drawing 7.

0108One of ten termites supplied after 1-hour progress from the injection of the termite to the petri dish which has arranged the extermination-of-harmful-insects material of the 4th above mentioned embodiment died, and remaining nine animals made extermination-of-harmful-insects material adhere all over the body, and it was only moving an antenna and a leg occasionally.

0109Nine animals had died after 2-hour progress from the injection of the termite, and the one remaining animals were cramping the leg with PIKUPIKU.

0110The one remaining animals had also died after 3-hour progress from the injection of the termite, and all the supplied termites died.

0111When the termite which died from the check test of this 4th embodiment was observed under the microscope, on the skin of the body surface of each termite, said extermination-of-harmful-insects material had adhered including the portion of a spiracle like the case of said 1st embodiment, and it was checked that the extermination-of-harmful-insects mechanism had been the same as said 1st embodiment.

0112Although not explained in full detail, the invention-in-this-application person did the check test with the same said of the clay as other argillite of this talc, bentonite, and the mixture that was powdered and added each of sepiolite to said natural zeolite.

0113 Clay is an aggregate of the particles which were able to do the mineral in rock by being decomposed and destroyed, and it corresponds to what is called clay. Bentonite is a kind of the argillite which uses montmorillonite, a BAIDERA night, etc. as an essential mineral, and it is also called the swelling ground. Sepiolite is a kind of the magnesium argillite by which the chemical composition is expressed with $Mg_9Si_{12}O_{30}(OH)_6(2H_2O)_4$ and $6H_2O$, and it is also called a sepiolite.

0114 When such argillite is used, it is checking that there are all extermination-of-harmful-insects effects, and it is thought that argillite generally has the extermination-of-harmful-insects effect in the state where it mixed with zeolite.

0115 Next, the 5th embodiment is described.

0116 The extermination-of-harmful-insects material of the 5th embodiment is the mixture which added diatomaceous earth to said natural zeolite.

By weight, the blending ratio carries out said zeolite, and makes diatomaceous earth 50% 50%.

0117 The remains of a diatom consist of a siliceous sedimentary rock formed in the seabed etc. by depositing, and diatomaceous earth contains clay, volcanic ash, an organic matter, etc.

0118 This diatomaceous earth is radio light by Showa Chemical Industry Co., Ltd. #500 (trade name).

It seems that the particle size distribution is shown in drawing 8.

The thing of the particle diameter which can serve as an active principle to the termite as a noxious insect in this diatomaceous earth is a little more than 80% in general so that it may become clear from drawing 8.

0119 Ten termites supplied after 1-hour progress from the injection of the termite to the petri dish which has arranged the extermination-of-harmful-insects material of the 5th above mentioned embodiment made all ten extermination-of-harmful-insects material adhere all over the body, and survived, eight animals moved about, and remaining two animals carried out the butter butter of an antenna or the leg.

0120 From the injection of the termite, ten termites supplied after 2-hour progress made all ten extermination-of-harmful-insects material adhere all over the body, and survived, and eight animals moved about, and the one remaining of two animals carried out the butter butter of an antenna or the leg, and it was only that the one remaining animals move a leg occasionally.

0121 It was only that all ten termites ten supplied after 3-hour progress survive from the injection of a termite, six animals move about, and four animals move an antenna and a leg slightly the remainder.

0122 Six animals died after 4-hour progress from the injection of the termite, and two of remaining four animals moved about, and it was only that two animals move an antenna and a leg occasionally.

0123 Nine animals died after 5-hour progress from the injection of the termite, and it was only that remaining one animal also moves an antenna and a leg occasionally. Since it was in ** that the extermination-of-harmful-insects material of the 5th aforementioned embodiment has the extermination-of-harmful-insects effect at this time, the check test was ended.

0124 When the termite which died from the check test of this 5th embodiment was observed under the microscope, on the skin of the body surface of each termite, said extermination-of-harmful-insects material had adhered including the portion of a spiracle like the case of said 1st embodiment, and it was checked that the extermination-of-harmful-insects mechanism had been the same as said 1st embodiment.

0125 Next, the 6th embodiment is described.

0126 The extermination-of-harmful-insects material of the 6th embodiment is the mixture which added milt to said natural zeolite.

By weight, the blending ratio carries out said zeolite, and makes milt 10% 90%.

0127 Milt is a general term for a pumiceous volcanic ash sediment, and the milt in this embodiment is the IJICHI Chemicals, Inc. win light S-20 (trade name).

It seems that the particle size distribution is shown in drawing 9.

The thing of the particle diameter which can serve as an active principle to the termite as a noxious insect in this milt is a little less than 70% in general so that it may become clear from drawing 9.

0128 Ten termites supplied after 1-hour progress from the injection of the termite to the petri dish which has arranged the extermination-of-harmful-insects material of the 6th above mentioned embodiment made all ten extermination-of-harmful-insects material adhere all over

the body, and survived, eight animals moved about, and remaining two animals carried out the butter butter of an antenna or the leg.

0129Four animals died among ten supplied termites after 2-hour progress from the injection of the termite, and it was only that no less than remaining six animals move an antenna and a leg occasionally.

0130All ten termites ten supplied after 3-hour progress from the injection of the termite died, and ended the check test.

0131Also in the termite which died from the check test of this 6th embodiment, on the skin of the body surface of each termite, said extermination-of-harmful-insects material had adhered including the portion of a spiracle like the case of said 1st embodiment, and it was checked that the extermination-of-harmful-insects mechanism had been the same as said 1st embodiment.

0132Next, the 7th embodiment is described.

0133The extermination-of-harmful-insects material of the 7th embodiment is the mixture which added calcium carbonate (CaCO_3) to said natural zeolite.

By weight, the blending ratio carries out said zeolite, and makes calcium carbonate 50% 50%.

0134This calcium carbonate is the MARUO CALCIUM COMPANY LIMITED special rice S (trade name).

It seems that the particle size distribution is shown in drawing 10.

In this calcium carbonate, that whole quantity is a thing of the particle diameter which can serve as an active principle to the termite as a noxious insect so that it may become clear from drawing 10.

0135Ten termites supplied after 1-hour progress from the injection of the termite to the petri dish which has arranged the extermination-of-harmful-insects material of the 7th above mentioned embodiment were making all ten extermination-of-harmful-insects material adhere all over the body, one animal died, and remaining nine animals carried out the butter butter of an antenna or the leg.

0136Supplied ten termite ***** had died after 2-hour progress from the injection of the termite, and the examination was ended.

0137Also in the termite which died from the check test of this 7th embodiment, on the skin of the body surface of each termite, said extermination-of-harmful-insects material had adhered including the portion of a spiracle like the case of said 1st embodiment, and it was checked that the extermination-of-harmful-insects mechanism had been the same as said 1st embodiment.

0138Next, the 8th embodiment is described.

0139The extermination-of-harmful-insects material of the 8th embodiment is the mixture which added fly ash to said natural zeolite.

By weight, the blending ratio carries out said zeolite, and makes fly ash 50% 50%.

0140Fly ash is the isolation ashes collected from stack gas, such as a boiler using coal of fine powder form, and the fly ash used in this embodiment is an ONODA super flow by Onoda Cement Co., Ltd. (trade name).

0141The particle size distribution of this fly ash is a thing of the particle diameter from which that whole quantity can serve as an active principle to the termite as a noxious insect in this fly ash so that it may become clear from drawing 11, as shown in drawing 11.

0142Ten termites supplied after 1-hour progress from the injection of the termite to the petri dish which has arranged the extermination-of-harmful-insects material of the 8th above mentioned embodiment made all ten extermination-of-harmful-insects material adhere all over the body, and survived, eight animals moved about, and remaining two animals carried out the butter butter of an antenna or the leg.

0143The inner 2 animal of ten termites supplied after 2-hour progress had died from the injection of the termite, and the remaining inner 1 animals moved about and it was only that seven animals move an antenna and a leg occasionally.

0144The inner 6 animal of ten supplied termites died after 3-hour progress from the injection of the termite, and it was only that no less than remaining four animals move an antenna and a leg slightly.

0145All the ten supplied termites had died after 4-hour progress from the injection of the termite, and the examination was ended.

0146Said extermination-of-harmful-insects material has adhered to the termite which died from the check test of this 8th embodiment including the portion of a spiracle on the skin of the body surface of each termite like the case of said 1st embodiment.

It was checked that the extermination-of-harmful-insects mechanism had been the same as said 1st embodiment.

0147Next, the 9th embodiment is described.

0148The extermination-of-harmful-insects material of the 9th embodiment is the mixture which added silica gel to said natural zeolite.

By weight, the blending ratio carries out said zeolite, and makes silica gel 50% 50%.

0149This silica gel is the FUJI home gel G by Fuji DEVISON chemistry incorporated company (trade name).

It is considered as the particle size distribution which crushes this and is shown in drawing 12. The thing of the particle diameter which can serve as an active principle according to said mechanism to the termite as a noxious insect in this silica gel is a little more than 35% in general, and most is a thing of a function which maintains the inside of said petri dish to a dry state so that it may become clear from drawing 12.

0150Although all ten termites **ten** supplied after 1-hour progress from the injection of the termite to the petri dish which has arranged the extermination-of-harmful-insects material of the 9th above mentioned embodiment survived, extermination-of-harmful-insects material was made to adhere all over the body, and it was only moving an antenna and a leg slightly.

0151Supplied ten termite ********* had died after 2-hour progress from the injection of the termite, and the examination was ended.

0152Although said extermination-of-harmful-insects material had adhered including the portion of a spiracle on the skin of the body surface of each termite like the case of said 1st embodiment and it was checked also in the termite which died from the check test of this 9th embodiment that the extermination-of-harmful-insects mechanism had been the same as said 1st embodiment, The peculiar black discoloration part exists in the body surface of a termite simultaneously, and it seems that this black discoloration part is formed with silica gel.

0153Next, the 10th embodiment is described.

0154The extermination-of-harmful-insects material of the 10th embodiment is the mixture which added the silicic anhydride (SiO_2) to said natural zeolite.

By weight, the blending ratio carries out said zeolite, and makes a silicic anhydride 50% 50%.

0155This silicic anhydride is Tokuyama Soda Co., Ltd. make Reolosil QS-102 (trade name). Since this particle size is within the limits of 75mmicro-275mmicro in general, it is small enough compared with the particle diameter which serves as an active principle by the aforementioned 1st thru/or the 3rd mechanism.

0156Although all ten extermination-of-harmful-insects material supplied after 1-hour progress from the injection of the termite to the petri dish which has arranged the extermination-of-harmful-insects material of the 10th above mentioned embodiment was made to adhere all over the body, three animals had died among those and two of remaining seven animals carried out the butter butter of an antenna or the leg, It was only that five animals move an antenna and a leg with PIKUN occasionally.

0157Supplied ten termite ********* had died after 2-hour progress from the injection of the termite, and the examination was ended.

0158Also in the termite which died from the check test of this 10th embodiment, on the skin of the body surface of each termite, said extermination-of-harmful-insects material had adhered including the portion of a spiracle like the case of said 1st embodiment, and it was checked that the extermination-of-harmful-insects mechanism had been the same as said 1st embodiment.

0159in each embodiment described above, it is a single taste about nature or artificial zeolite -- it is, although what constituted extermination-of-harmful-insects material as a mixture which mixed the solid suitably was explained, It cannot be overemphasized that an application concerned is good also as adding the weak drugs of drug effect not only this but, for example like way acid, and it is good also as supposing that the addition rate of a solid is adjusted suitably, or combining two or more kinds of solids, and adding.

0160In **as explained above** these embodiments, Since it is the extermination-of-harmful-insects material which added a proper solid and weak drugs using zeolite, extermination-of-harmful-insects material is not so powerful as conventionally, and the handling of drugs, such as spraying operation, is not asked for the prudence like conventional, but there is an advantage which can give facilities to handling.

0161

Effect of the InventionAs explained above, since zeolite has a humidity buffer effect according to the extermination-of-harmful-insects material according to claim 1, the humidity of the space in which this extermination-of-harmful-insects material was installed can be maintained at a dry state unsuitable to habitation of a noxious insect.

0162Therefore, in the space where this extermination-of-harmful-insects material was constructed, even if a noxious insect's noxious insect which cannot live easily and lives in this space decreases and a noxious insect lives, that noxious insect will live, after the vital force has weakened.

0163And since said zeolite contains the thing in which the particle diameter is smaller than the interval size of the hair of a noxious insect, The fine-grained fraction can adhere to the body surface of a noxious insect, without being barred by the hair of the noxious insect which lives here, and since discharge of the carbon dioxide from the skin of a noxious insect is controlled by this, it can make a noxious insect die of respiratory failure.

0164Since the particles of the fine-grained fraction of said zeolite can be made to adhere to a spiracle and introduction of oxygen of a noxious insect is barred by this when the noxious insect for extermination is what has a spiracle, a noxious insect can be made to die by an oxygen deficiency.

0165Moreover, generally, insects, such as a noxious insect, perform operation which shakes off that foreign matter when a foreign matter adheres to that body surface and hair, and a noxious insect produces abrasion in a body surface itself by this operation.

Said fine-grained fraction can suck the body fluid of a noxious insect out of this abrasion by the hygroscopicity which zeolite has, and can make a noxious insect die by considering it as dehydration by adhering to abrasion, without being barred by hair.

0166Such zeolite is what does not have as strong toxicity as the conventional extermination-of-harmful-insects agent, and also it does so the good extermination-of-harmful-insects effect according to the above mechanisms.

0167Therefore, there can be little adverse effect to men and beasts other than a noxious insect and fear of environmental pollution, and a noxious insect cannot possess the resistance accompanying use, but the extermination-of-harmful-insects material which can exterminate a noxious insect certainly can be provided over a long period of time.

Industrial ApplicationThis invention relates to extermination-of-harmful-insects material.

Description of the Prior ArtIt is common to use a chemical insecticide, when exterminating noxious insects including a termite, TSUMEDANI, etc., for example, when aiming at extermination of a termite or ticks, the powerful chemical insecticide of acute toxicity is widely used like organic phosphorus system drugs or pyrethroid system drugs.

Effect of the InventionAs explained above, since zeolite has a humidity buffer effect according to the extermination-of-harmful-insects material according to claim 1, the humidity of the space in which this extermination-of-harmful-insects material was installed can be maintained at a dry state unsuitable to habitation of a noxious insect.

0162Therefore, in the space where this extermination-of-harmful-insects material was constructed, even if a noxious insect's noxious insect which cannot live easily and lives in this space decreases and a noxious insect lives, that noxious insect will live, after the vital force has weakened.

0163And since said zeolite contains the thing in which the particle diameter is smaller than the interval size of the hair of a noxious insect, The fine-grained fraction can adhere to the body surface of a noxious insect, without being barred by the hair of the noxious insect which lives here, and since discharge of the carbon dioxide from the skin of a noxious insect is controlled by this, it can make a noxious insect die of respiratory failure.

0164Since the particles of the fine-grained fraction of said zeolite can be made to adhere to a

spiracle and introduction of oxygen of a noxious insect is barred by this when the noxious insect for extermination is what has a spiracle, a noxious insect can be made to die by an oxygen deficiency.

0165Moreover, generally, insects, such as a noxious insect, perform operation which shakes off that foreign matter when a foreign matter adheres to that body surface and hair, and a noxious insect produces abrasion in a body surface itself by this operation.

Said fine-grained fraction can suck the body fluid of a noxious insect out of this abrasion by the hygroscopicity which zeolite has, and can make a noxious insect die by considering it as dehydration by adhering to abrasion, without being barred by hair.

0166Such zeolite is what does not have as strong toxicity as the conventional extermination-of-harmful-insects agent, and also it does so the good extermination-of-harmful-insects effect according to the above mechanisms.

0167Therefore, there can be little adverse effect to men and beasts other than a noxious insect and fear of environmental pollution, and a noxious insect cannot possess the resistance accompanying use, but the extermination-of-harmful-insects material which can exterminate a noxious insect certainly can be provided over a long period of time.

FunctionSince zeolite has a humidity buffer effect according to the extermination-of-harmful-insects material according to claim 1, the humidity of the space in which this extermination-of-harmful-insects material was installed can be maintained at a dry state unsuitable to habitation of a noxious insect.

0008Therefore, in the space where this extermination-of-harmful-insects material was constructed, even if a noxious insect's noxious insect which cannot live easily and lives in this space decreases and a noxious insect lives, that noxious insect will live, after the vital force has weakened.

0009And since said zeolite contains the thing in which the particle diameter is smaller than the interval size of the hair of a noxious insect, The fine-grained fraction can adhere to the body surface of a noxious insect, without being barred by the hair of the noxious insect which lives here, and since discharge of the carbon dioxide from the skin of a noxious insect is controlled by this, it can make a noxious insect die of respiratory failure.

0010Since the particles of the fine-grained fraction of said zeolite can be made to adhere to a spiracle and introduction of oxygen of a noxious insect is barred by this when the noxious insect for extermination is what has a spiracle, a noxious insect can be made to die by an oxygen deficiency.

0011Moreover, generally, insects, such as a noxious insect, perform operation which shakes off that foreign matter when a foreign matter adheres to that body surface and hair, and a noxious insect produces abrasion in a body surface itself by this operation.

Said fine-grained fraction can suck the body fluid of a noxious insect out of this abrasion by the hygroscopicity which zeolite has, and can make a noxious insect die by considering it as dehydration by adhering to abrasion, without being barred by hair.

0012Such zeolite is what does not have as strong toxicity as the conventional extermination-of-harmful-insects agent, and also it does so the good extermination-of-harmful-insects effect according to the above mechanisms.

0013Therefore, there can be little adverse effect to men and beasts other than a noxious insect and fear of environmental pollution, and a noxious insect cannot possess the resistance accompanying use, but the extermination-of-harmful-insects material which can exterminate a noxious insect certainly can be provided over a long period of time.

Working exampleAlthough an embodiment explains this invention hereafter, referring to Drawings, the extermination-of-harmful-insects effect by zeolite is explained to the beginning.

0015Since it is thought that the physical extermination-of-harmful-insects effect by zeolite is produced by the following three mechanisms' compounding and functioning according to an invention-in-this-application person's research, they are explained below.

0016First, drawing 1 explains the 1st mechanism.

0017 Drawing 1 is a mimetic diagram of the body surface of a noxious insect, and, as for 1, the skin of the body surface of a noxious insect and 3 are hair of a noxious insect a noxious insect and 2.

41, 42, 43, and 44 are extermination-of-harmful-insects material which consists of powdered zeolite.

0018 This noxious insect 1 has taken in oxygen inside of the body through a spiracle or the skin 2.

Discharge of the carbon dioxide to the outside of the body is performed through the direct skin 2.

0019 And two or more hair 3 is formed in the skin 2 which discharges carbon dioxide in this way at the shape of a dissemination.

0020 Such hair 3 is formed in the position according to the kind of noxious insect 1, respectively.

If a ** type-izing **various kinds of noxious insects are taken into consideration** and standardly, although it is what differs also in the interval size of these hair 3, for the simplification of the following explanation, the interval size P of each hair 3 will come out uniformly, and let it be a certain thing so that the arrangement of the hair 3 on the skin 2 of the noxious insect 1 may be drawing 1.

0021 Although the extermination-of-harmful-insects material 41, 42, 43, and 44 is a thing of various form actual naturally, in order to simplify explanation of the following mechanisms, in Drawings, it shall display as circular, and each shall differ only in the particle diameter.

0022 Thus, the extermination-of-harmful-insects material 41, 42, and 43 to the skin 2 top in which the hair 3 is formed, and the situation of adhesion of 44 are as follows.

0023 That is, although the particle diameter D_1 of the extermination-of-harmful-insects material 41 is a little smaller than the interval size P of the hair 3, it is almost equivalent.

0024 Therefore, the extermination-of-harmful-insects material 41 can reach the skin 2 of the noxious insect 1 through the gap of the hair 3.

0025 And the extermination-of-harmful-insects material 41 which reached on the skin 2 of the noxious insect 1 will adhere on the skin 2 with lipid, moisture, etc. on the skin 2.

0026 As for the skin 2 of the portion located under the extermination-of-harmful-insects material 41, the exocytosis of the carbon dioxide from the surface is barred by this. In the case of the noxious insect which takes in oxygen from the skin 2, introduction of oxygen from the skin 2 of the part concerned is also simultaneously barred by this extermination-of-harmful-insects material 41.

0027 The particle diameter D_2 of the extermination-of-harmful-insects material 42 is smaller than said extermination-of-harmful-insects material 41, and the particle diameter of the extermination-of-harmful-insects material 43 is still smaller than particle diameter D_2 of said extermination-of-harmful-insects material 42.

0028 The extermination-of-harmful-insects material 42 and 43 in which the particle diameter is smaller than said extermination-of-harmful-insects material 41 can reach the skin 2 of the noxious insect 1, without being barred by said hair 3 so that clearly also from drawing 1, like said extermination-of-harmful-insects material 41, adheres on the skin 2 and bars the exocytosis of the carbon dioxide of the noxious insect 1, etc.

0029 The extermination-of-harmful-insects material 44 is a comparative example in the example of this explanation, and that particle diameter D_4 is larger than the interval size P of said hair 3. Since one of the hair 3 will bar the adhesion so that clearly from drawing 1, the extermination-of-harmful-insects material 44 of this particle diameter cannot bar exocytosis of the carbon dioxide from the skin 2 of the noxious insect 1, etc. like said extermination-of-harmful-insects material 41, 42, and 43.

0030 When discharge of the carbon dioxide from the skin 2 of the portion is barred by adhesion of said extermination-of-harmful-insects material 41, 42, and 43, When a function falls according to the area of the adhering portion in general and the area of the portion crosses tolerance level, it becomes respiratory failure and, as for the respiration of the noxious insect 1, the noxious insect 1 will die finally.

0031 Therefore, in exterminating a noxious insect using such extermination-of-harmful-insects material. Expansion of the area to which the extermination-of-harmful-insects material 41, 42,

and 43 to the skin 2 adhered is very important, and the purpose of extermination of harmful insects is attained through expansion of said adhesion area by selecting suitably the particle diameter of extermination-of-harmful-insects material according to a noxious insect.

0032Next, although drawing 2 explains the 2nd mechanism, this 2nd mechanism is restricted when the noxious insect for extermination is what has a spiracle.

0033Drawing 2 is what showed the section in the spiracle of a noxious insect typically, and, as for the noxious insect to which 1 has a spiracle, and 2, the skin of the body surface of a noxious insect and 3 are hair of a noxious insect.

0034In the noxious insect 1 which has a spiracle, the trachea 5 prolonged from the inside of the body of the noxious insect 1 carries out an opening to the skin 2, forms the spiracle 6, and it these tracheae 5 and spiracles 6, Constituting the tracheal system 7 of the noxious insect 1, the tracheal system 7 has the function as a passage to lead the oxygen which the noxious insect 1 takes in inside of the body to the inside of the body.

0035In the noxious insect 1 which has such a spiracle 6, the interval size of the hair 3 is set to P near the spiracle 6, and the opening size (diameter) of the spiracle 6 is set to W.

0036And although 81, 82, 83, and 84 are extermination-of-harmful-insects material which consists of powdered zeolite in drawing 2, respectively and these extermination-of-harmful-insects material 81, 82, 83, and 84 is a thing of various form actual naturally, Displaying as a globular form in Drawings, in order to simplify explanation of the following mechanisms, each shall differ only in the particle diameter.

0037In about six spiracle of the noxious insect 1, the actions differ more how, the extermination-of-harmful-insects material 81, 82, and 83 functions as an active principle in the following explanation, and the extermination-of-harmful-insects material 81, 82, 83, and 84 is a thing of the particle diameter by which the extermination-of-harmful-insects material 84 is positioned as a comparative example.

0038That is, it is smaller than the interval size P of the hair 3, and the particle diameter D_5 of the extermination-of-harmful-insects material 81 is larger than the opening size W of the spiracle 6.

0039Therefore, the extermination-of-harmful-insects material 81 can reach the skin 2 of the noxious insect 1 through the gap of the hair 3, and can be located in the surface side of the spiracle 6. And the extermination-of-harmful-insects material 81 which reached on the skin 2 of the noxious insect 1 will adhere on the skin 2 with lipid, moisture, etc. on the skin 2, the spiracle 6 is covered and blockaded by said extermination-of-harmful-insects material 81, and incorporation of oxygen from the spiracle 6 is checked.

0040The particle diameter D_6 of the extermination-of-harmful-insects material 82 is a little smaller than the interval size P of the hair 3, and the opening size W of the spiracle 6.

0041Therefore, although the extermination-of-harmful-insects material 82 reaches the skin 2 of the noxious insect 1 like said extermination-of-harmful-insects material 81, it can invade in the trachea 5 from the spiracle 6 further.

0042Since the extermination-of-harmful-insects material 82 which introduction of oxygen of the noxious insect 1 was spoiled, and invaded since the ventilation area of the trachea 5 became small substantially when the extermination-of-harmful-insects material 82 invaded into the trachea 5 does not drop out of the trachea 5 easily, the noxious insect 1 dies certainly eventually by a prolonged oxygen deficiency.

0043In the extermination-of-harmful-insects material 83 whose particle diameter is still smaller than said extermination-of-harmful-insects material 82, Said hair 3 does not almost have becoming trouble, when the extermination-of-harmful-insects material 83 reaches to the skin 2 of the noxious insect 1, and moreover, since it is a size whose spiracle 6 is also quite larger than the extermination-of-harmful-insects material 83, the extermination-of-harmful-insects material 83 can invade in the trachea 5 with comparatively high probability.

0044Thus, although it is difficult to blockade the trachea 5 like said extermination-of-harmful-insects material 82 only by single particles, the extermination-of-harmful-insects material 83 which invaded in the trachea 5, Since it invades in the trachea 5 with above comparatively high probability, by two or more extermination-of-harmful-insects material's 83 adhering, and accumulating it, the aeration cross-section area of the trachea 5 will become small, and the noxious insect 1 will be in anoxic conditions.

0045In the case of said noxious insect 1, the extermination-of-harmful-insects material 84 becomes with a comparative example, and the particle diameter D_7 is larger than the interval size P of said hair 3.

0046In such a case, since the extermination-of-harmful-insects material 84 cannot reach the skin 2 of the noxious insect 1 by the hair 3, the blockade function to the spiracle 6 is not expectable. However, since the interval size P of said hair 3 and the opening size W of the spiracle 6 take the value which changes with kinds of noxious insect, it can act as a thing equivalent to the extermination-of-harmful-insects material 81-83 which this extermination-of-harmful-insects material 84 described above depending on the kind of noxious insect.

0047Thus, since the extermination-of-harmful-insects material 81, 82, and 83 adheres to the tracheal system 7 of the noxious insect 1 and introduction of oxygen from the spiracle 6 of the noxious insect 1 is barred, the noxious insect 1 dies by an oxygen deficiency, and attains the purpose of extermination of harmful insects.

0048Next, although drawing 3 explains the 3rd mechanism, this 3rd mechanism is a physical extermination-of-harmful-insects mechanism using the humidity buffer effect which zeolite has.

0049Although natural zeolite and artificial zeolite exist in zeolite, any zeolite has bigger, ion exchange capacity general in general than 50 meq(s)/100 g.

It has the humidity buffer effect or hygroscopicity required in order that the 3rd mechanism described below may function.

0050The noxious insect 1 shall perform the action which tries to shake off that foreign matter itself when a foreign matter generally adheres to that skin 2 and hair 3, the abrasion 11 shall arise on the skin 2 of the noxious insect 1 in connection with this action, and the body fluid of the noxious insect 1 shall begin to bleed on the skin 2.

0051Therefore, when the extermination-of-harmful-insects material 12 which becomes a part of the abrasion 11 formed by doing in this way from said zeolite is contacted, the body fluid of the noxious insect 1 will be *****ed) by the humidity buffer effect or hygroscopicity of the zeolite 12, and the noxious insect 1 will die by drying.

0052In order for such a mechanism to function, it is required for zeolite to arrive even at the part of said abrasion 11 on the skin 2, but. As mentioned above, since the hair 3 generally exists in the skin 2 of the noxious insect 1 and this bars contact of said extermination-of-harmful-insects material 12 on it, it is important for it to avoid the obstacle by this hair 3 and to make the extermination-of-harmful-insects material 12 arrive at the part of the abrasion 11 on the skin 2.

0053Therefore, when zeolite is made powdered and particle diameter D_g of the extermination-of-harmful-insects material 12 which consists of the powdered zeolite considers it as a thing smaller than the interval size P of the hair 3 of the noxious insect 1, The probability to the portion of the abrasion 11 of the extermination-of-harmful-insects material 12 of contacting can be raised, and a noxious insect can be made to die certainly by this.

0054The extermination-of-harmful-insects material 13 illustrates the situation where it is barred that that particle diameter D_g shows a larger thing than the interval size P of said hair 3, and this extermination-of-harmful-insects material 13 contacts the part of the abrasion 11 when the hair 3 exists. In drawing 3, in order to make an understanding of the 3rd mechanism easy, the extermination-of-harmful-insects material 12 and 13 was displayed simple as spherical, but it cannot be overemphasized actually that they are various odd shape.

0055The advantage common to the 1st thru/or the 3rd mechanism by the powdered zeolite explained above is being able to exterminate a noxious insect, without transpiring the strong chemical of acute toxicity at high concentration in the space which should exterminate a noxious insect unlike insect killing by the conventional chemical insecticide.

Since it is performed by the physical property of a powdered solid, without providing a noxious insect with resistance gradually while originating in this and being able to avoid the influence and the environmental pollution of a chemical insecticide to men and beasts, it is that a noxious insect is exterminable over a long period of time.

0056The extermination-of-harmful-insects effect of zeolite considered to produce by the above 1st thru/or the 3rd mechanism's compounding, and functioning was checked by the following check tests.

0057That is, this check test covers a petri dish with filter paper, on this filter paper, it covers with powdered extermination-of-harmful-insects material uniformly, and it accustoms it, puts ten noxious insects in the petri dish of this state, and observes the active state of a noxious insect temporarily.

0058The petri dish used by this check test is a thing 9 cm in diameter.

It shall suppose that said 0.64g (it is equivalent to the state where extermination-of-harmful-insects material was sprinkled at a rate of 100g / m²) of extermination-of-harmful-insects material is put in, and is performed, and the worker ant of *Coptotermes formosanus* shall be used as a noxious insect.

0059In this case, the opening size W of 63 micrometers and a spiracle of the interval size P of said hair of the noxious insect 1 is 30 micrometers in general.

0060Hereafter, the check test of the extermination-of-harmful-insects effect of the 1st embodiment and the 2nd embodiment which are the extermination-of-harmful-insects material which used natural zeolite by a single taste is explained.

0061The extermination-of-harmful-insects material of these 1st and 2nd embodiments makes the fine-grained fraction which crushed the zeolite rock which is the aluminosilicate mineral produced naturally extermination-of-harmful-insects material.

0062The natural zeolite used for the 1st embodiment is an IZUKA light by Izumo chemistry incorporated company (trade name), and it is ZEOFIRU by new northeast chemical industry incorporated company (trade name) which is used for the 2nd embodiment.

0063The chemical entity (weight %) of the natural zeolite used for these 1st and 2nd embodiments is shown in front .1. The chemical entity of the artificial zeolite which is the 3rd below-mentioned embodiment is also collectively shown in front .1.

0064

Front .1

For drawings please refer to the original document.

After crushing each zeolite rock which has such a chemical entity by a publicly known crusher, particle sorting was performed and it was considered as the extermination-of-harmful-insects material of the 1st and 2nd embodiments.

0065And when the ion exchange capacity of the extermination-of-harmful-insects material of these 1st and 2nd embodiments was measured based on the zeolite test method of an inherent-powers improvement enforcement ordinance, respectively, the 1st embodiment was 130 to 160 meq/100g, and the 2nd embodiment was 150 to 170 meq/100g.

0066Thus, as the particle size distribution of the extermination-of-harmful-insects material of the 1st embodiment that consists of formed powdered natural zeolite is drawing 4, the particle size distribution of the 2nd embodiment is as being shown in drawing 5.

0067In the case of the extermination-of-harmful-insects material which consists of natural zeolite of said 1st embodiment, from such size distribution figures, Particle diameter is smaller than 63 micrometers which is an interval size of the hair of a noxious insect, and it is a little more than 85% which functions as an active principle in the 1st thru/or the 3rd mechanism, among those 65% is an active principle applicable to the extermination-of-harmful-insects material 82 and 83 in said 2nd mechanism in general. And although there is little remainder which is except these active principles as a little less than 15%, these remainders do so the function to reduce the humidity in the space where extermination-of-harmful-insects material was sprinkled chiefly.

0068In the case of the extermination-of-harmful-insects material which consists of natural zeolite of said 2nd embodiment, It is 40% which functions as an active principle in the 1st thru/or the 3rd mechanism in general by the weight, and among those, in said 2nd mechanism, it is an active principle applicable to the extermination-of-harmful-insects material 82 and 83, and the remainders which are except these active principles have increased in number with 60% in general a little more than 25%.

0069The result of the check test using the extermination-of-harmful-insects material which consists of such powdered natural zeolite is as follows, and is explained in order below.

0070First, the case of the natural zeolite of the 1st embodiment is explained.

0071In after from the injection of the termite to the petri dish which has arranged the extermination-of-harmful-insects material which consists of natural zeolite of the 1st above mentioned embodiment 1-hour progress, Ten supplied termites made all ten extermination-of-harmful-insects material adhere all over the body, and survived, the inner 8 animal moved about, and remaining two animals carried out the butter butter of an antenna and the leg in each part.

0072Four animals had died after 2-hour progress from the injection of the termite, and it was

only that no less than the six remaining animals move an antenna and a leg occasionally in each part.

0073Nine animals had died after 3-hour progress from the injection of the termite, and the one remaining animals carried out the butter butter of an antenna or the leg.

0074Nine animals had died after 4-hour progress from the injection of the termite, and the one remaining animals carried out the PIKUPIKU spasm of the leg.

0075Ten animals had died after 5-hour progress from the injection of the termite, and the check test was ended.

0076Next, the case of the natural zeolite of the 2nd embodiment is explained.

0077Although ten termites supplied after 1-hour progress from the injection of the termite to the petri dish which has arranged the extermination-of-harmful-insects material which consists of natural zeolite of the 2nd above mentioned embodiment survive, the inner 5 animal moved about and remaining five animals carried out the butter butter of an antenna and the leg in each part.

0078Nine animals had died after 2-hour progress from the injection of the termite, and the one remaining animals were cramping the leg with PIKUPIKU.

0079The one remaining animals had also died after 3-hour progress from the injection of the termite, and all the supplied termites died.

0080If the termite which died from the check test of these 1st and 2nd embodiments is observed under a microscope, On the skin of the body surface of each termite, said extermination-of-harmful-insects material which consists of powdered natural zeolite has adhered including the portion of a spiracle, and said 1st thru/or the 3rd mechanism compound, all function, and it can be guessed that they are those from which the termite died.

0081Next, the check test of the extermination-of-harmful-insects effect in the case of the 3rd embodiment used by a single taste by making artificial zeolite into extermination-of-harmful-insects material is explained.

0082In this case, the artificial zeolite used as extermination-of-harmful-insects material of the 3rd embodiment is coal ash zeolite by Nippon Steel Corp., and formed the extermination-of-harmful-insects material which consists of powdered artificial zeolite.

0083Thus, the ion exchange capacity of the extermination-of-harmful-insects material of the 3rd embodiment that consists of formed powdered artificial zeolite is 200 to 350 meq/100g, and the chemical entity is as having indicated to said table .1.

0084The particle size distribution of the extermination-of-harmful-insects material of the 3rd embodiment that consists of this powdered artificial zeolite is as drawing 6. It is a little more than 95% which functions as an active principle in the 1st thru/or the 3rd mechanism, and a little more than 85% is an active principle applicable to the extermination-of-harmful-insects material 82 and 83 in said 2nd mechanism among those.

0085The result of the check test of the extermination-of-harmful-insects effect done like the above using the extermination-of-harmful-insects material which consists of this powdered artificial zeolite is as follows.

0086In after from the injection of the termite to the petri dish which has arranged the extermination-of-harmful-insects material which consists of the above mentioned powdered artificial zeolite 1-hour progress, Ten supplied termites made all ten extermination-of-harmful-insects material adhere all over the body, and survived, the inner 8 animal moved about, and remaining two animals carried out the butter butter of an antenna and the leg in each part.

0087One animal had died after 2-hour progress from the injection of the termite, and although the six remaining animals moved about, three animals only moved the antenna and the leg with PIKUPIKU.

0088Two animals had died after 3-hour progress from the injection of the termite, the seven remaining animals carried out the butter butter of an antenna and the leg, and one animal which remains was moving slowly.

0089Seven animals had died after 4-hour progress from the injection of the termite, and the three remaining animals carried out the butter butter of an antenna and the leg.

0090Nine animals had died after 5-hour progress from the injection of the termite, and the one remaining animals carried out the butter butter of the leg. Since it was in ** that the extermination-of-harmful-insects material which consists of the above mentioned powdered artificial zeolite has the extermination-of-harmful-insects effect, the check test was ended at this time.

0091Also in the termite which died from this check test, it was the same as that of the case of the extermination-of-harmful-insects material which said powdered extermination-of-harmful-insects material has adhered including the portion of a spiracle on the skin of the body surface of each termite, and consists of said natural zeolite.

0092Therefore, it is thought that said 1st thru/or the 3rd mechanism compound similarly, and the extermination-of-harmful-insects effect of zeolite functions not only in natural zeolite but in artificial zeolite. Even if it is the artificial zeolite which used not only the aforementioned coal ash zeolite but milt as the raw material, the artificial zeolite which used blast furnace slag as the raw material, or permutite manufactured chemically, it is thought that it has the extermination-of-harmful-insects effect.

0093Thus, said 1st thru/or the 3rd mechanism proved by powdered nature and artificial zeolite to the termite as a noxious insect. Since it is physically materialized in the relation between the interval size P of the hair 3 of the noxious insect 1 made the particle diameter of the powdered zeolite which is extermination-of-harmful-insects material, and applicable to extermination, or the opening size W of the spiracle 6 as described above, it is possible to use it to various kinds of noxious insects.

0094If the noxious insect which can be made applicable using the extermination-of-harmful-insects material of the invention in this application to extermination is mentioned, For example, not to mention TSUMEDANI of other termites and house ticks, a dust mite, an acarid mite, or cockroaches, Mosquitoes, flies, Siphonaptera, Anoplura, a powder-post beetle, SHIBAMMUSHI, NOSHIMEDARAMEIGA, Oryzaephilus, Tribolium castaneum, a rice weevil, Callosobruchus, a HIMEMARU carpet beetle, HIMEKATSUOBUSHIMUSHI, a clothes moth, Chironomus, Psychodidae, Pentatomorpha, Abu, Ixodidae, the Stomoxys calcitrans, Chilo, a planthopper, Nephrotettix, a soybean beetle, SHIROICHIMOJIMADARAMEIGA, sink IMUSHI, Pulvinaria, spider mites, aphids, a cabbage moth, an armyworm, a YASAI elephant beetle, Monochamus alternatus, and woodengravers. They are scarab beetles, SUJIKIRIYOTOU, SHIBATSUTOGA, etc.

0095The dust mite and acarid mite of the house ticks among the aforementioned noxious insects, Since it does not have a spiracle but oxygen from the skin 2 is taken in, When the extermination-of-harmful-insects material of the invention in this application is used, said 2nd mechanism does not function, but the natural zeolite which adhered to the skin according to the 1st mechanism, While performing the extermination by checking not only discharge of carbon dioxide but introduction of oxygen, it is certainly exterminable by drying from abrasion according to said 3rd mechanism.

0096And so that clearly from the above mentioned 1st thru/or the 3rd mechanism, when aimed at the different aforementioned noxious insect from a termite, Since the particle diameter of the thing used as the active principle of extermination-of-harmful-insects material becomes settled according to the interval size P etc. of the hair of the noxious insect made into the object, It is preferred to adjust suitably the particle size distribution of the extermination-of-harmful-insects material to be used, and it is efficient to classify only the thing of particle diameter smaller than the interval P of the hair of the noxious insect in the case of the extermination-of-harmful-insects material which sets the noxious insect of a specific kind as an extermination target, and to use this for it as extermination-of-harmful-insects material.

0097For example, when making TSUMEDANI of house ticks into the noxious insect for extermination, the interval size of the hair is 30 micrometers in general.

0098If the extermination-of-harmful-insects material (thing of the particle size distribution of drawing 4) of said 1st embodiment is used for this TSUMEDANI, a little more than 65% of thing will function in general by weight % as an active principle which may reach the skin of TSUMEDANI.

0099Since the opening size W of the spiracle of TSUMEDANI is 1 micrometer in general, in said 2nd mechanism, the active principle which may function as the extermination-of-harmful-insects material 82 and 83 is a little less than 5% in weight %.

0100Therefore, if the particle size distribution of the extermination-of-harmful-insects material to be used is adjusted to what has many fine-grained fractions in this case and the interval size P of the hair 3 of that noxious insect, i.e., what, have larger particle diameter than 30 micrometers is excepted, Since the probability that extermination-of-harmful-insects material will adhere on the skin of TSUMEDANI increases, the extermination-of-harmful-insects effect becomes much more remarkable.

0101When performing extermination of harmful insects using the zeolite in which the extermination-of-harmful-insects effect was checked as mentioned above, nature or artificial

zeolite may be used by a single taste like said each embodiment, but it is realistic to consider it as a mixture with the solid used as the reinforcement which strengthens a proper extender and the extermination-of-harmful-insects effect.

0102In this viewpoint, the invention-in-this-application person checked that each embodiment which consists of a mixture of the following solid material and zeolite had the extermination-of-harmful-insects effect as a result of the experiment using various kinds of solid material.

0103Although the result of the check test of those each embodiment and its extermination-of-harmful-insects effect is shown below, the zeolite used for these check tests is the same as that of said 1st embodiment, and the method of a check test of it is the same as that of the above.

0104First, the extermination-of-harmful-insects material of the 4th embodiment is explained.

0105The extermination-of-harmful-insects material of the 4th embodiment is the mixture which added talc which is argillite to said natural zeolite.

By weight, the blending ratio carries out said zeolite, and makes talc 10% 90%.

0106Talc is a kind of the magnesium argillite in which it is also called talc and the chemical formula is made into $Mg_3Si_4O_{10}(OH)_2$.

0107It seems that this talc is MARUO CALCIUM COMPANY LIMITED "3S Talc" (trade name), and that particle size distribution is shown in drawing 7. In this talc, that whole quantity is the particle diameter which can serve as an active principle to the termite as a noxious insect so that it may become clear from drawing 7.

0108One of ten termites supplied after 1-hour progress from the injection of the termite to the petri dish which has arranged the extermination-of-harmful-insects material of the 4th above mentioned embodiment died, and remaining nine animals made extermination-of-harmful-insects material adhere all over the body, and it was only moving an antenna and a leg occasionally.

0109Nine animals had died after 2-hour progress from the injection of the termite, and the one remaining animals were cramping the leg with PIKUPIKU.

0110The one remaining animals had also died after 3-hour progress from the injection of the termite, and all the supplied termites died.

0111When the termite which died from the check test of this 4th embodiment was observed under the microscope, on the skin of the body surface of each termite, said extermination-of-harmful-insects material had adhered including the portion of a spiracle like the case of said 1st embodiment, and it was checked that the extermination-of-harmful-insects mechanism had been the same as said 1st embodiment.

0112Although not explained in full detail, the invention-in-this-application person did the check test with the same said of the clay as other argillite of this talc, bentonite, and the mixture that was powdered and added each of sepiolite to said natural zeolite.

0113Clay is an aggregate of the particles which were able to do the mineral in rock by being decomposed and destroyed, and it corresponds to what is called clay. Bentonite is a kind of the argillite which uses montmorillonite, a BAIDERA night, etc. as an essential mineral, and it is also called the swelling ground. Sepiolite is a kind of the magnesium argillite by which the chemical composition is expressed with $Mg_9Si_{12}O_{30}(OH)_6(OH_2)_4$ and $6H_2O$, and it is also called a sepiolite.

0114When such argillite is used, it is checking that there are all extermination-of-harmful-insects effects, and it is thought that argillite generally has the extermination-of-harmful-insects effect in the state where it mixed with zeolite.

0115Next, the 5th embodiment is described.

0116The extermination-of-harmful-insects material of the 5th embodiment is the mixture which added diatomaceous earth to said natural zeolite.

By weight, the blending ratio carries out said zeolite, and makes diatomaceous earth 50% 50%.

0117The remains of a diatom consist of a siliceous sedimentary rock formed in the seabed etc. by depositing, and diatomaceous earth contains clay, volcanic ash, an organic matter, etc.

0118This diatomaceous earth is radio light by Showa Chemical Industry Co., Ltd. #500 (trade name).

It seems that the particle size distribution is shown in drawing 8.

The thing of the particle diameter which can serve as an active principle to the termite as a noxious insect in this diatomaceous earth is a little more than 80% in general so that it may become clear from drawing 8.

0119Ten termites supplied after 1-hour progress from the injection of the termite to the petri dish which has arranged the extermination-of-harmful-insects material of the 5th above mentioned embodiment made all ten extermination-of-harmful-insects material adhere all over the body, and survived, eight animals moved about, and remaining two animals carried out the butter butter of an antenna or the leg.

0120From the injection of the termite, ten termites supplied after 2-hour progress made all ten extermination-of-harmful-insects material adhere all over the body, and survived, and eight animals moved about, and the one **remaining** of two animals carried out the butter butter of an antenna or the leg, and it was only that the one remaining animals move a leg occasionally.

0121It was only that all ten termites **ten** supplied after 3-hour progress survive from the injection of a termite, six animals move about, and four animals move an antenna and a leg slightly **the remainder**.

0122Six animals died after 4-hour progress from the injection of the termite, and two of remaining four animals moved about, and it was only that two animals move an antenna and a leg occasionally.

0123Nine animals died after 5-hour progress from the injection of the termite, and it was only that remaining one animal also moves an antenna and a leg occasionally. Since it was in ** that the extermination-of-harmful-insects material of the 5th aforementioned embodiment has the extermination-of-harmful-insects effect at this time, the check test was ended.

0124When the termite which died from the check test of this 5th embodiment was observed under the microscope, on the skin of the body surface of each termite, said extermination-of-harmful-insects material had adhered including the portion of a spiracle like the case of said 1st embodiment, and it was checked that the extermination-of-harmful-insects mechanism had been the same as said 1st embodiment.

0125Next, the 6th embodiment is described.

0126The extermination-of-harmful-insects material of the 6th embodiment is the mixture which added milt to said natural zeolite.

By weight, the blending ratio carries out said zeolite, and makes milt 10% 90%.

0127Milt is a general term for a pumiceous volcanic ash sediment, and the milt in this embodiment is the IJICHI Chemicals, Inc. win light S-20 (trade name).

It seems that the particle size distribution is shown in drawing 9.

The thing of the particle diameter which can serve as an active principle to the termite as a noxious insect in this milt is a little less than 70% in general so that it may become clear from drawing 9.

0128Ten termites supplied after 1-hour progress from the injection of the termite to the petri dish which has arranged the extermination-of-harmful-insects material of the 6th above mentioned embodiment made all ten extermination-of-harmful-insects material adhere all over the body, and survived, eight animals moved about, and remaining two animals carried out the butter butter of an antenna or the leg.

0129Four animals died among ten supplied termites after 2-hour progress from the injection of the termite, and it was only that no less than remaining six animals move an antenna and a leg occasionally.

0130All ten termites **ten** supplied after 3-hour progress from the injection of the termite died, and ended the check test.

0131Also in the termite which died from the check test of this 6th embodiment, on the skin of the body surface of each termite, said extermination-of-harmful-insects material had adhered including the portion of a spiracle like the case of said 1st embodiment, and it was checked that the extermination-of-harmful-insects mechanism had been the same as said 1st embodiment.

0132Next, the 7th embodiment is described.

0133The extermination-of-harmful-insects material of the 7th embodiment is the mixture which added calcium carbonate (CaCO_3) to said natural zeolite.

By weight, the blending ratio carries out said zeolite, and makes calcium carbonate 50% 50%.

0134This calcium carbonate is the MARUO CALCIUM COMPANY LIMITED special rice S (trade name).

It seems that the particle size distribution is shown in drawing 10.

In this calcium carbonate, that whole quantity is a thing of the particle diameter which can serve as an active principle to the termite as a noxious insect so that it may become clear from drawing 10.

0135Ten termites supplied after 1-hour progress from the injection of the termite to the petri dish which has arranged the extermination-of-harmful-insects material of the 7th above mentioned embodiment were making all ten extermination-of-harmful-insects material adhere all over the body, one animal died, and remaining nine animals carried out the butter butter of an antenna or the leg.

0136Supplied ten termite ***** had died after 2-hour progress from the injection of the termite, and the examination was ended.

0137Also in the termite which died from the check test of this 7th embodiment, on the skin of the body surface of each termite, said extermination-of-harmful-insects material had adhered including the portion of a spiracle like the case of said 1st embodiment, and it was checked that the extermination-of-harmful-insects mechanism had been the same as said 1st embodiment.

0138Next, the 8th embodiment is described.

0139The extermination-of-harmful-insects material of the 8th embodiment is the mixture which added fly ash to said natural zeolite.

By weight, the blending ratio carries out said zeolite, and makes fly ash 50% 50%.

0140Fly ash is the isolation ashes collected from stack gas, such as a boiler using coal of fine powder form, and the fly ash used in this embodiment is an ONODA super flow by Onoda Cement Co., Ltd. (trade name).

0141The particle size distribution of this fly ash is a thing of the particle diameter from which that whole quantity can serve as an active principle to the termite as a noxious insect in this fly ash so that it may become clear from drawing 11, as shown in drawing 11.

0142Ten termites supplied after 1-hour progress from the injection of the termite to the petri dish which has arranged the extermination-of-harmful-insects material of the 8th above mentioned embodiment made all ten extermination-of-harmful-insects material adhere all over the body, and survived, eight animals moved about, and remaining two animals carried out the butter butter of an antenna or the leg.

0143The Inner 2 animal of ten termites supplied after 2-hour progress had died from the injection of the termite, and the remaining inner 1 animals moved about and it was only that seven animals move an antenna and a leg occasionally.

0144The inner 6 animal of ten supplied termites died after 3-hour progress from the injection of the termite, and it was only that no less than remaining four animals move an antenna and a leg slightly.

0145All the ten supplied termites had died after 4-hour progress from the injection of the termite, and the examination was ended.

0146Said extermination-of-harmful-insects material has adhered to the termite which died from the check test of this 8th embodiment including the portion of a spiracle on the skin of the body surface of each termite like the case of said 1st embodiment.

It was checked that the extermination-of-harmful-insects mechanism had been the same as said 1st embodiment.

0147Next, the 9th embodiment is described.

0148The extermination-of-harmful-insects material of the 9th embodiment is the mixture which added silica gel to said natural zeolite.

By weight, the blending ratio carries out said zeolite, and makes silica gel 50% 50%.

0149This silica gel is the FUJI home gel G by Fuji DEVISON chemistry incorporated company (trade name).

It is considered as the particle size distribution which crushes this and is shown in drawing 12. The thing of the particle diameter which can serve as an active principle according to said mechanism to the termite as a noxious insect in this silica gel is a little more than 35% in general, and most is a thing of a function which maintains the inside of said petri dish to a dry state so that it may become clear from drawing 12.

0150Although all ten termites **ten** supplied after 1-hour progress from the injection of the termite to the petri dish which has arranged the extermination-of-harmful-insects material of the 9th above mentioned embodiment survived, extermination-of-harmful-insects material was made to adhere all over the body, and it was only moving an antenna and a leg slightly.

0151Supplied ten termite ***** had died after 2-hour progress from the injection of the termite, and the examination was ended.

0152Although said extermination-of-harmful-insects material had adhered including the portion

of a spiracle on the skin of the body surface of each termite like the case of said 1st embodiment and it was checked also in the termite which died from the check test of this 9th embodiment that the extermination-of-harmful-insects mechanism had been the same as said 1st embodiment. The peculiar black discoloration part exists in the body surface of a termite simultaneously, and it seems that this black discoloration part is formed with silica gel.

0153Next, the 10th embodiment is described.

0154The extermination-of-harmful-insects material of the 10th embodiment is the mixture which added the silicic anhydride (SiO_2) to said natural zeolite.

By weight, the blending ratio carries out said zeolite, and makes a silicic anhydride 50% 50%.

0155This silicic anhydride is Tokuyama Soda Co., Ltd. make Reolosil QS-102 (trade name). Since this particle size is within the limits of 75mmicro-275mmicro in general, it is small enough compared with the particle diameter which serves as an active principle by the aforementioned 1st thru/or the 3rd mechanism.

0156Although all ten extermination-of-harmful-insects material supplied after 1-hour progress from the injection of the termite to the petri dish which has arranged the extermination-of-harmful-insects material of the 10th above mentioned embodiment was made to adhere all over the body, three animals had died among those and two of remaining seven animals carried out the butter butter of an antenna or the leg, It was only that five animals move an antenna and a leg with PIKUN occasionally.

0157Supplied ten termite ***** had died after 2-hour progress from the injection of the termite, and the examination was ended.

0158Also in the termite which died from the check test of this 10th embodiment, on the skin of the body surface of each termite, said extermination-of-harmful-insects material had adhered including the portion of a spiracle like the case of said 1st embodiment, and it was checked that the extermination-of-harmful-insects mechanism had been the same as said 1st embodiment.

0159In each embodiment described above, it is a single taste about nature or artificial zeolite -- it is, although what constituted extermination-of-harmful-insects material as a mixture which mixed the solid suitably was explained, It cannot be overemphasized that an application concerned is good also as adding the weak drugs of drug effect not only this but, for example like way acid, and it is good also as supposing that the addition rate of a solid is adjusted suitably, or combining two or more kinds of solids, and adding.

0160In as explained above these embodiments, Since it is the extermination-of-harmful-insects material which added a proper solid and weak drugs using zeolite, extermination-of-harmful-insects material is not so powerful as conventionally, and the handling of drugs, such as spraying operation, is not asked for the prudence like conventional, but there is an advantage which can give facilities to handling.

Problem to be solved by the inventionBy the way, although this kind of chemical insecticide exterminates a noxious insect by the drug effect of that chemical constituent, many that chemical constituent has an adverse effect to men and beasts, and we are anxious also about the environmental pollution which makes spraying of the strong chemical of acute toxicity a cause.

0004With use of a chemical insecticide, a noxious insect is gradually provided with insecticide resistance (resistance), and it arises that the effective chemical insecticide stops doing the effect as an insecticide so eventually at the beginning.

0005It was made based on such a background, and there are little adverse effect to men and beasts other than a noxious insect and fear of environmental pollution, and a noxious insect does not possess the resistance accompanying use, but an object of this invention is to provide the extermination-of-harmful-insects material which can exterminate a noxious insect certainly over a long period of time.

Means for solving problemIn order to attain this purpose, the invention according to claim 1 is the extermination-of-harmful-insects material containing powdered zeolite, and contains what has particle diameter smaller than the interval size of the hair of the noxious insect used as the

candidate for extermination in that powdered zeolite.

Brief Description of the Drawings

Drawing 1 It is an explanation mimetic diagram of the 1st mechanism about the extermination of harmful insects by the extermination-of-harmful-insects material of the invention in this application.

Drawing 2 It is an explanation mimetic diagram of the 2nd mechanism about the extermination of harmful insects by the extermination-of-harmful-insects material of the invention in this application.

Drawing 3 It is an explanation mimetic diagram of the 3rd mechanism about the extermination of harmful insects by the extermination-of-harmful-insects material of the invention in this application.

Drawing 4 It is the size distribution figures of the natural zeolite of the 1st embodiment.

Drawing 5 It is the size distribution figures of the natural zeolite of the 2nd embodiment.

Drawing 6 It is the size distribution figures of the artificial zeolite of the 3rd embodiment.

Drawing 7 It is the size distribution figures of the talc used for the 4th embodiment.

Drawing 8 It is the size distribution figures of the diatomaceous earth used for the 5th embodiment.

Drawing 9 It is the size distribution figures of milt used for the 6th embodiment.

Drawing 10 It is the size distribution figures of the calcium carbonate used for the 7th embodiment.

Drawing 11 It is the size distribution figures of the fly ash used for the 8th embodiment.

Drawing 12 It is the size distribution figures of the silica gel used for the 9th embodiment.

Explanations of letters or numerals

D₁, D₂, D₄, D₅, D₆, D₇, D₈, and D₉ particle diameter

P (Hair) Interval

1 Noxious insect

2 Skin

3 Hair

11 Abrasion

12,13,41, 42,43,44, and 81,82,83 Extermination-of-harmful-insects material

Drawing 1

For drawings please refer to the original document.

Drawing 2

For drawings please refer to the original document.

Drawing 3

For drawings please refer to the original document.

Drawing 5

For drawings please refer to the original document.

Drawing 4

For drawings please refer to the original document.

Drawing 6

For drawings please refer to the original document.

Drawing 7

For drawings please refer to the original document.

Drawing 8

For drawings please refer to the original document.

Drawing 9

For drawings please refer to the original document.

Drawing 10

For drawings please refer to the original document.

Drawing 11

For drawings please refer to the original document.

Drawing 12

For drawings please refer to the original document.

For drawings please refer to the original document.

AN 120:238328 CA Full-text
 OREF 120:42069a,42072a
 TI Coated pesticide.
 IN Homma, Yasuo; Arimoto, Yutaka
 PA Rikagaku Kenkyuzyo, Japan
 SO Eur. Pat. Appl., 13 pp.
 CODEN: EPXXDW
 DT Patent
 LA English
 FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	EP 579951	A1	19940126	EP 1993-109572	19930616
	EP 579951	B1	19980909		
	R: DE, ES, FR,	GR, IT			
	JP 06040806	A	19940215	JP 1992-197228	19920723 <--
	ES 2120461	T3	19981101	ES 1993-109572	19930616
PRAI	JP 1992-197228	A	19920723		

AB A pesticide (100 parts by weight) is coated with 0.1-10 parts aliphatic acid esters of aliphatic polyols and/or phospholipids, and 0.01-10 parts by weight sizing agent. A solution of 4 g glycerin monooleate in 100 mL acetone was treated with 100 g CuSO₄ followed by solvent evaporation. The resulting powder was treated with 0.05 g alginic acid, to give a powdery water-soluble concentration having good fluidity.